

Group 7 Elements

Question Paper

Level	GCSE
Subject	Chemistry
Exam Board	Edexcel IGCSE
Module	Double Award (Paper 1C)
Topic	Chemistry of the Elements
Sub-Topic	Group 7 Elements - Chlorine, Bromine & Iodine
Booklet	Question Paper

Time Allowed: 72 minutes

Score: /60

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	75%	70%	60%	55%	50%	<50%

Edexcel (I)GCSE

Chemistry

Double Award (Paper 1C)

Chemistry of The Elements: Group 7

Total Marks: 60

You must have:

Ruler

Calculator

Instructions:

Use black ink or ball-point pen.

Answer All questions.

Answer the questions in the spaces provided there may be more space than you need

Show all the steps in any calculations and state the units.

Information:

The total mark for this paper is 60

The marks for each question are shown in brackets use this as a guide as to how much time to spend on each question.

Advice:

Read each question carefully before you start to answer it.

Keep an eye on the time.

Write your answers neatly and in good English.

Try to answer every question.

Check your answers if you have time at the end.

1 Bromine, chlorine and iodine are elements in Group 7 of the Periodic Table.

(2)

(a) (i) Identify which of these elements has

the palest colour

the highest melting point

(ii) Give the name of another Group 7 element that is a solid at room temperature.

(1)

.....

(b) When chlorine and hydrogen react together, hydrogen chloride gas forms.

Write a chemical equation for this reaction.

(2)

.....

(c) Some hydrogen chloride gas is bubbled into separate samples of water and methylbenzene. A piece of blue litmus paper is dipped into each solution.

(i) State, with a reason, the final colour of the litmus paper in the solution in water.

(2)

.....

.....

.....

.....

(ii) State, with a reason, the final colour of the litmus paper in the solution in methylbenzene.

(2)

.....

.....

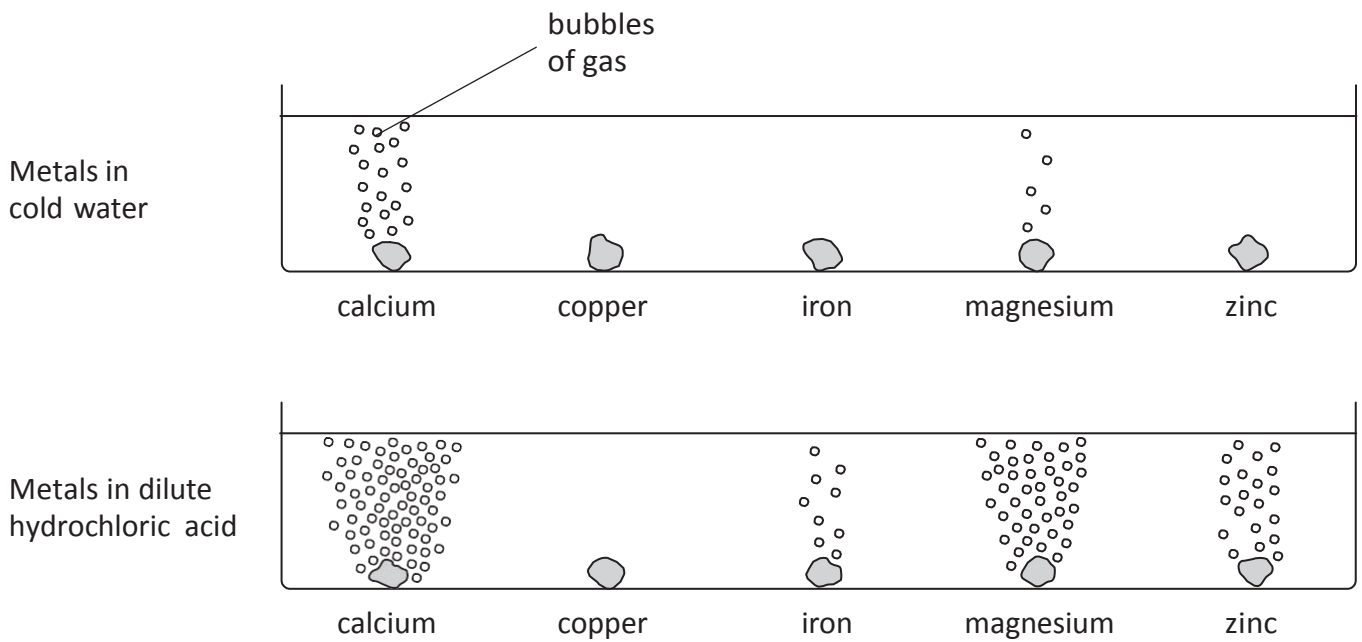
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(Total for Question 1 = 9 marks)

2 The diagrams show the reactions of some metals with cold water and with dilute hydrochloric acid.



(a) Answer the following questions, using only the metals that appear in the diagrams.

(i) Name **two** metals that react with cold water.

(2)

..... and

(ii) Name **one** metal that reacts with dilute hydrochloric acid but **not** with cold water.

(1)

.....

(iii) Arrange the five metals in order of reactivity.

(3)

Most reactive metal

.....

.....

.....

Least reactive metal

- (b) Some magnesium powder is added to dilute sulfuric acid in a test tube.
A colourless solution is formed and a gas is given off.

When more magnesium is added, the reaction continues for a while and then stops, leaving some magnesium powder in the test tube.

When a flame is placed at the mouth of the test tube, the gas burns with a squeaky pop.

- (i) Identify the gas produced. (1)

.....

- (ii) Suggest why the reaction stops. (1)

.....

.....

- (iii) State the name of the colourless solution. (1)

.....

- (iv) How could you separate the magnesium powder from the colourless solution? (1)

.....

.....

- (c) In some fireworks, magnesium powder reacts quickly with oxygen in the air.
During this reaction heat energy is produced.

- (i) What name is given to reactions in which heat energy is produced? (1)

.....

- (ii) Name the compound formed when magnesium reacts with oxygen. (1)

.....

(Total for Question 2 = 12 marks)

3 The halogens are elements in Group 7 of the Periodic Table.

(a) Put a cross in the box to indicate your answer.

(i) Chlorine gas is

(1)

A brown

B colourless

C green

D violet

(ii) At room temperature, the physical state of bromine is

(1)

A solid

B liquid

C gas

D aqueous solution

(b) Which is the most reactive element in Group 7?

(1)

(c) Chlorine reacts with hydrogen to form a colourless gas that dissolves in water to form an acid.

(i) What is the name of the colourless gas?

(1)

(ii) What is the name of the acid?

(1)

(iii) What is the formula that is used to represent both the colourless gas and the acid?

(1)

(Total for Question 3 = 6 marks)

4 The halogens are elements in Group 7 of the Periodic Table.

The halogens react with metals to form compounds called halides.

Table 1 shows information about some halogens and their halides.

Halogen	Appearance at room temperature	Halide	Melting point in °C
chlorine	green gas	lithium chloride	605
bromine	red-brown liquid	sodium bromide	747
iodine	grey solid	potassium iodide	681

Table 1

(a) (i) Predict the physical state of fluorine at room temperature.

(1)

(ii) Predict how the colour of astatine at room temperature compares with the colour of iodine.

(1)

(b) Each of the halides in table 1 was dissolved in water to form a solution.

A sample of each of the halogens was then added to some of the halide solutions.

Table 2 shows the results.

Halide	Halogen added		
	Chlorine	Bromine	Iodine
lithium chloride	not done	no reaction	no reaction
sodium bromide	orange solution	not done	no reaction
potassium iodide	brown solution	brown solution	not done

Table 2

(i) Suggest why there is no reason to add chlorine to lithium chloride solution.

(1)

(ii) Why was there no reaction when iodine was added to sodium bromide solution? (1)

(iii) Name the substance with the brown colour that formed when chlorine was added to potassium iodide solution. (1)

(iv) The reaction between bromine and potassium iodide solution is a displacement reaction.
What is the correct description of this reaction? (1)

- A bromide displaces iodide
- B bromine displaces iodide
- C bromide displaces iodine
- D bromine displaces iodine

(v) Complete the chemical equation for the reaction between chlorine and potassium bromide solution. (1)



(Total for Question 4 = 7 marks)

5 The table gives information about the first four elements in Group 7 of the Periodic Table.

Element	Atomic number	Electronic configuration	Physical state at 20 C	Colour at 20 C
fluorine	9	2.7	gas	pale yellow
chlorine	17	2.8.7	gas	pale green
bromine	35	2.8.18.7	liquid	red-brown
iodine	53	2.8.18.18.7	solid	dark grey

(a) Astatine (At) has an atomic number of 85 and is the fifth element in Group 7.

It is possible to make predictions about astatine by comparison with the other elements in Group 7.

(i) How many electrons does an atom of astatine have in its outer shell? (1)

.....

(ii) What physical state and colour would you expect for astatine at 20 C? (2)

Physical state

Colour

(iii) Predict the formula of the compound formed between astatine and hydrogen.

Suggest a name for this compound. (2)

Formula

Name

(iv) Suggest how the reactivity of astatine compares to that of iodine.

Explain your answer. (2)

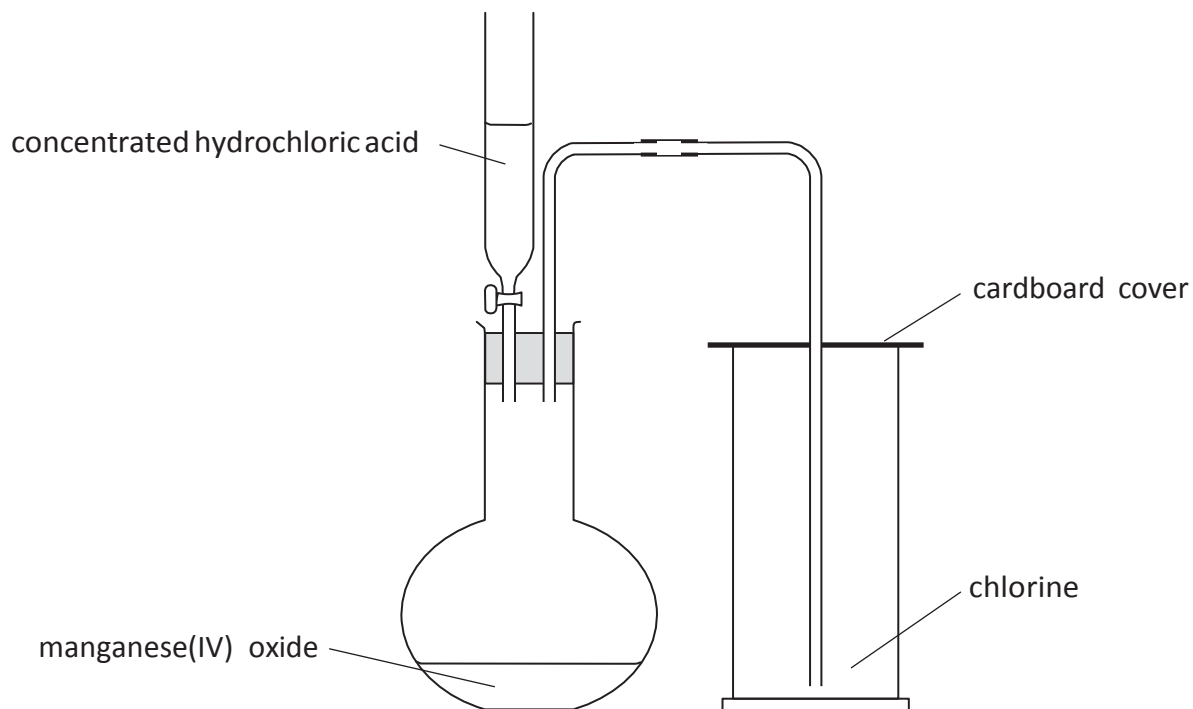
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(b) Chlorine gas can be prepared by heating a mixture of concentrated hydrochloric acid and manganese(IV) oxide using this apparatus.



(i) Balance the equation for the reaction.

(1)



(ii) State what you would observe when a piece of damp litmus paper is placed into the gas jar containing chlorine.

(1)

.....

.....

(c) Chlorine can be used to obtain bromine (Br_2) from sea water.

Sea water contains bromide ions, Br^-

The pH of sea water is usually within the range of 7.5 to 8.4

The stages in the extraction of bromine from sea water are

Stage 1 The pH of the sea water is lowered to about 3.5

Stage 2 An excess of chlorine is bubbled through the sea water

Stage 3 The bromine (Br_2) is removed from the mixture and reacted with sulfur dioxide (SO_2) and water. This reaction converts the bromine to hydrogen bromide (HBr) and sulfuric acid (H_2SO_4)

Stage 4 The hydrogen bromide is reacted with chlorine to form bromine (Br_2)

(i) Suggest a substance that could be added to lower the pH of sea water in Stage 1. (1)

.....
(ii) Why is an excess of chlorine added in Stage 2? (1)

.....
(iii) Write a chemical equation for the reaction in Stage 3. (2)

.....
(iv) Write a chemical equation for the reaction in Stage 4. (1)

.....
(d) State the colour change observed when bromine is added to an aqueous solution of potassium iodide. (2)

Colour of potassium iodide solution at start.....

Colour of final reaction mixture.....

(Total for Question 5 = 16 marks)

6 This question is about elements in Group 7 of the Periodic Table.

(a) Complete the table to show the physical state at room temperature of fluorine and astatine, and the colour of liquid bromine.

(2)

Element	Colour	Physical state at room temperature
fluorine	pale yellow	
chlorine	pale green	gas
bromine		liquid
iodine	dark grey	solid
astatine	black	

(b) Chlorine reacts with hydrogen to form hydrogen chloride.

A piece of magnesium ribbon is added to hydrogen chloride in three separate experiments under different conditions.

The table below shows the observations made under these different conditions.

Experiment	Conditions	Observations
1	Hydrogen chloride gas	No visible change
2	Hydrogen chloride dissolved in water	The magnesium ribbon gets smaller and bubbles are seen
3	Hydrogen chloride dissolved in methylbenzene	No visible change

(i) Write the formulae of two ions formed in the solution produced in experiment 2.

(2)

Positive ion.....

Negative ion.....

(ii) Identify the gas formed in experiment 2 and give a test for it.

(2)

gas

test

.....

(iii) Silver nitrate solution and dilute nitric acid are added to the solution produced in experiment 2.

State what is observed and name the substance responsible for this observation.

Explain why dilute nitric acid is added.

(3)

observation.....

.....

substance responsible.....

explanation.....

.....

(iv) Explain why there is no reaction in experiment 3.

(1)

.....

.....

(Total for Question 6 = 10 marks)